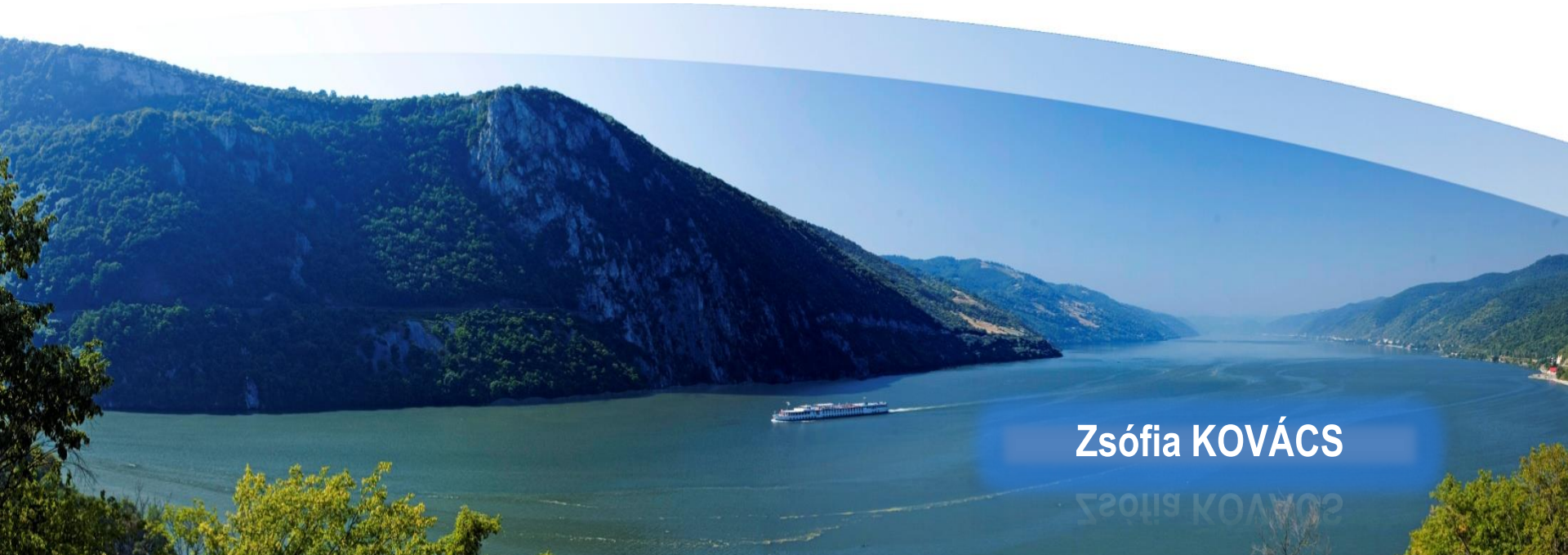
DANUBE REGION strategy
Water Quality

PA4 Steering Group
7th meeting

Water Quality Early Warning System
on Transboundary Watercourses of Tisza River Basin

28 March 2014, Budapest



Zsófia KOVÁCS

CONTENT

BACKGROUND

4 PARTS OF THE INITIAL STUDY

Recommended Life-Implementation Cycle

WIDER CONTEXT

Natural phenomena

know no state boundaries

thus their management and adaptation for them need actions

Early Warning System (EWS)

- essential for both the upstream and downstream countries
- for warning and forecasting of possible catastrophic events
- and helping timely reactions.

- does not replace the monitoring processes required and undertaken by the states
- it would give help in the analysis and solutions of problems
- it would provide continuous timelines from the whole catchment territory
- some elements of the alarm system may already exist in some countries
- full interoperability required in case of devices, ICT, databases

EWS
on the Tisza water basin

- to replace the **missing link** in the monitoring system
- currently don't have timelines with sufficient frequency to draw conclusions about the **continuous** development of the state of our watercourses
- currently don't have appropriately detailed and composed unified **parameter** information

Protection and management of water resources are the key elements of ***SUSTAINABLE DEVELOPMENT***

The aim of the study was

- Basic ***ASSUMPTION***: to lay down the basics of the strategy for the „basic" Water Quality EWS, and
- to define the ***FRAMEWORK*** of the extendable, configurable and specializeable automatic monitoring system, which includes installation, infrastructural and ICT elements
- Basic ***COOKBOOK*** approach: a catalogue system that recommends a pre-modelled, detailed and applicable scenario for particular situations.

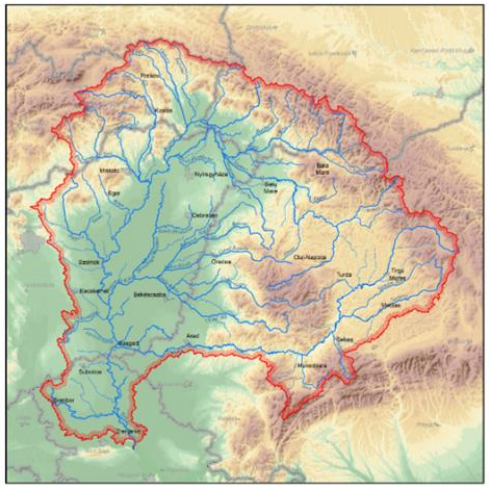
STUDY

The four parts of the STUDY

1. Proposal of ***INSTALLATION SITES AND MEASUREMENT PARAMETERS*** for the monitoring system on the Tisza river basin
2. Evaluation of ***MEASUREMENT METHODS*** applicable on monitoring stations, and introduction and specification of the monitoring devices necessary for implementation.
3. Evaluation of technically applicable ***SAMPLING SYSTEMS*** of EWS, taking into account different riverbed types, sample and data archivation system types and introduction of design options.
4. Calculation of ***INVESTMENT AND OPERATIONAL COSTS*** for monitoring system to be developed

Part 1

Specifying recommended **installation locations** of monitoring system and recommended monitoring **parameters** in the Tisza catchment area.



WATER QUALITY EARLY WARNING SYSTEM

ON TRANSBOUNDARY WATERCOURSES of Tisza river basin

Chapter 1-2

Chapter 1-2

Veszprem Regional *Innovation Center, HU*

THE TISZA RIVER BASIN

Introduction

Cross-border cooperation
country analysis

Basic data

Thematic information

Catchment area

Legal framework
UA-RO-SK-HU-SRB

Ecrins water network
SRTM terrain model

ICPDR maps
National RBMP
ARS studies
Pollution sources

Methodology of
designating monitoring locations

The planned elements of the early warning monitoring system are as follows:

a) ***Transboundary*** *water sites*

b) *Water course sections under* ***hazardous objects*** *choosing the points*

c) *Exploring spots characterizing* ***sub-basins*** *&* ***major water courses***

b) in a way that pollution getting into the water through points like inputs and spill on the ground are also signaled

c) Apart from high-risk objects potentially polluting water courses, there are numerous pollution sources with lower risk on the sub-basins. Among others, they are the objects listed in the E-PRTR (European Pollutant Release and Transfer Register) and UWWTD (Urban Waste Water Treatment Directive) spots. In addition, due to diffuse load/pollution on sub-basins, it is practical to establish a point network ensuring general coverage.

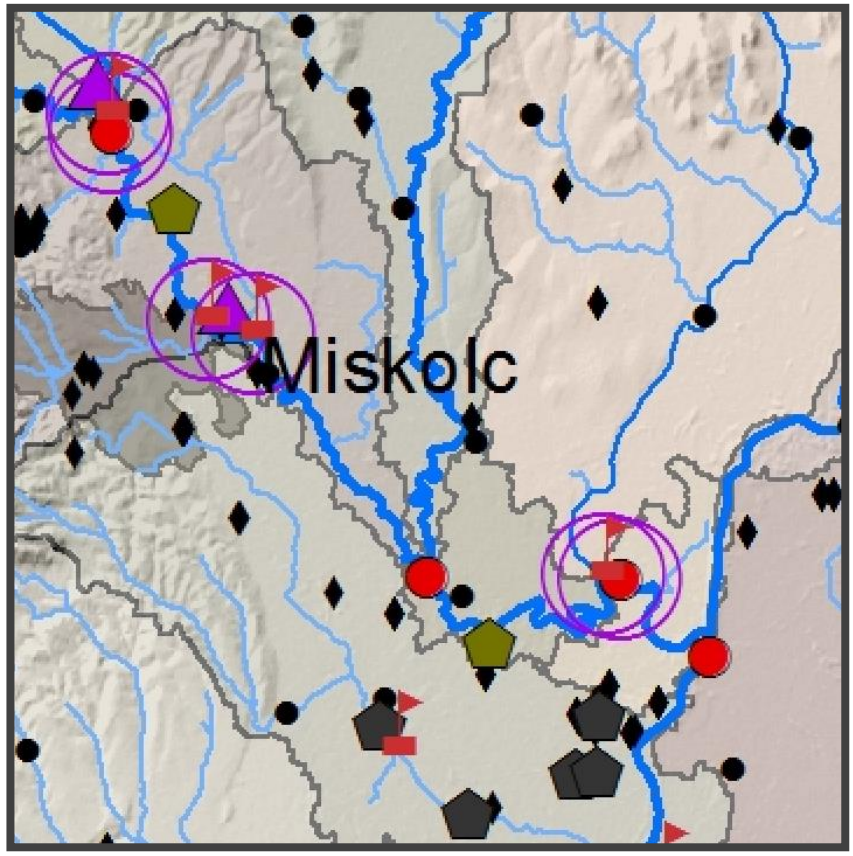
Recommendation for
the number of monitoring stations

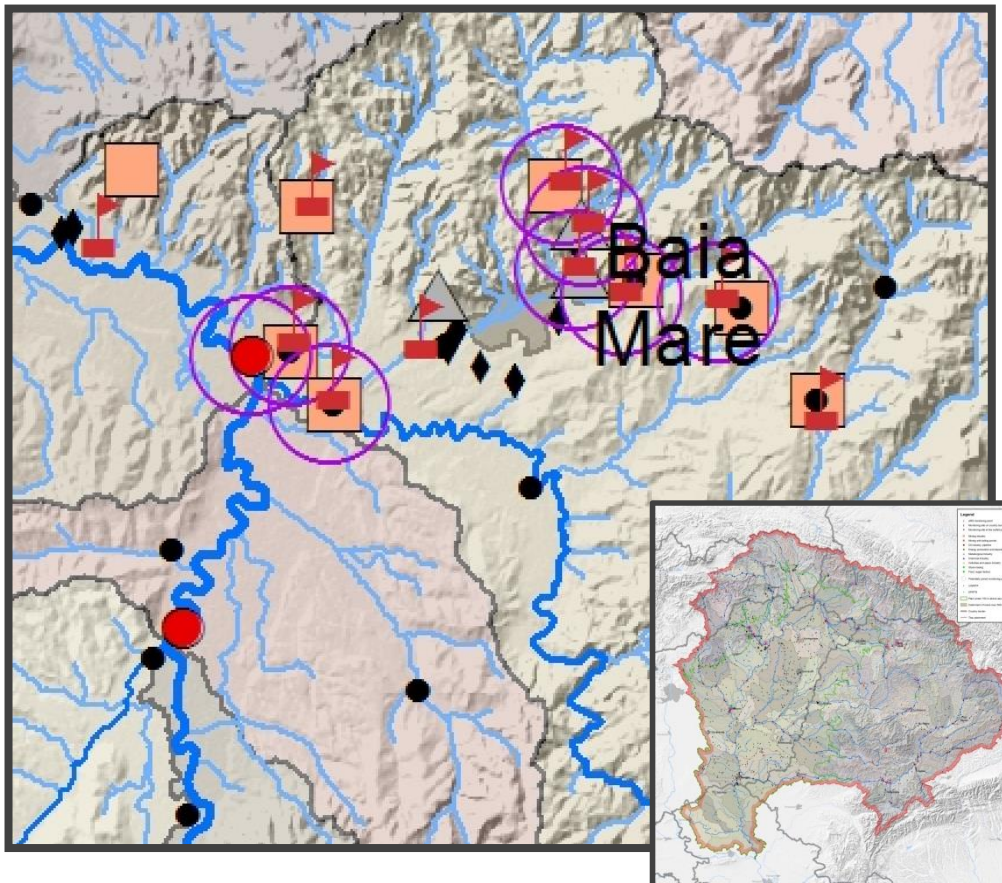
Version by catchment area (km^2)		Monitoring points			
		ARS	Border	Catchment	Total
500	**With all rivers**	50	23	86	159
	Without plain rivers	50	23	61	134
1000	**With all rivers**	50	21	49	120
	Without plain rivers	50	21	38	109
3000	**With all rivers**	50	14	16	80

** Aim: reducing the number of monitoring stations to a sustainable number which can still ensure achieving the aim of EWS monitoring network.*

Potentially joined points

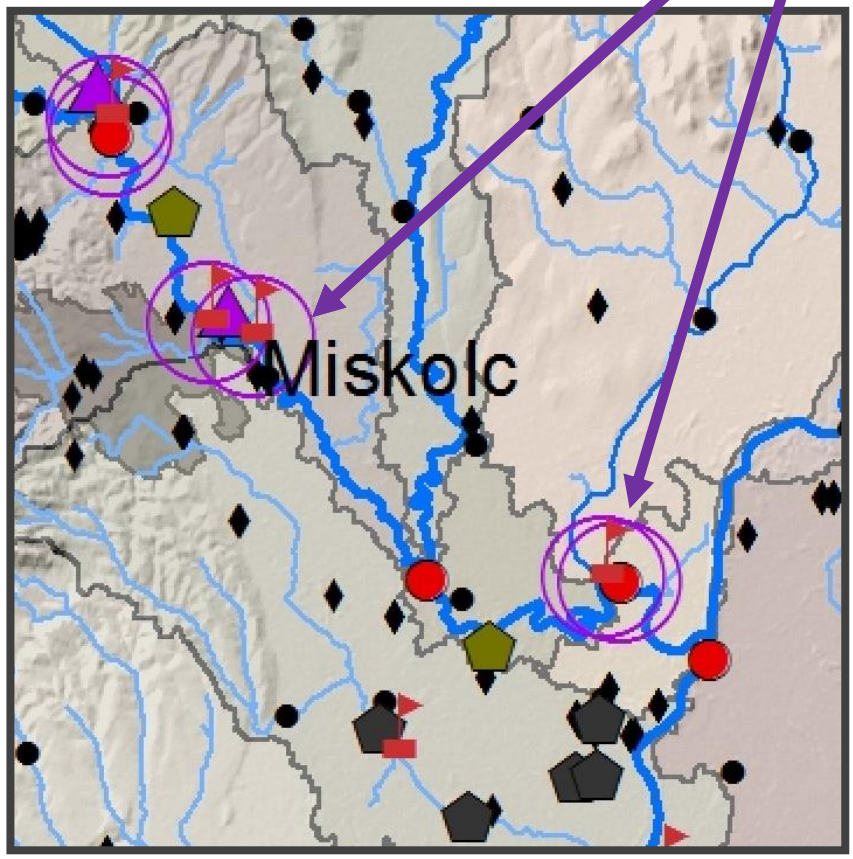
52 points must be studied individually

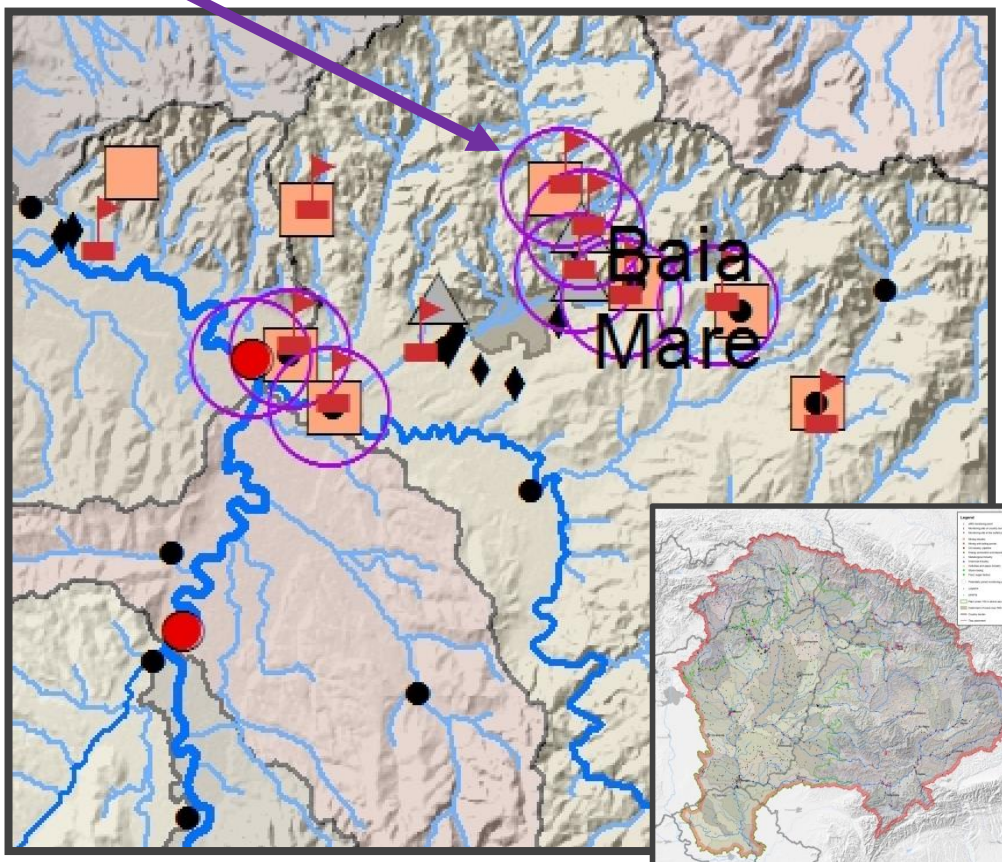




- If we do not exclude the plain rivers and do not join points within 5 kilometer proximity, **Tisza catchment would be covered** by designated 159 stations.
- Out of 159 points, in 52 points another point is within 5 kilometer. It means that **52 points must be studied individually** to decide whether monitoring points can be joined or not. *If yes, 26 points* out of 159 points are excluded and the number of final monitoring points would be modified to 133

Example: 500 km^2 catchments





Methodology of
planning: parameters

1	Collection of background information	Integration of EWS system - Existing monitoring systems - WFD monitoring sites and results.
2	Mapping of pollution sources in the watershed	Pollution from point and diffuse sources: Hot spots: Sewage treatment plant, industrial and urban wastewater discharges, thermal spa effluents . Diffuse pollution sources: agricultural areas, farm runoffs
3	Selection of measurement spots	After point sources, at connection of tributaries
4	**Choosing measurement parameters**	**Knowing the sources of pollution we can decide, which parameters are important from the perspective of setting up an alarm system customized to the local hazards. These parameters can be physical (conductivity, heat), or chemical (pH, concentrations of organic or inorganic compounds, etc) tailored to the local needs. Cost effectiveness of choosing the appropriate parameters is also of importance**
5	Measurement frequency	Mixture of pollutants, pollutant plume alarm may influence measurement, bringing the need of more frequent measurements. Chemical requirements and energy …
6	Measurement toolkits	Measurement methods and tools fitting to WFD typology (high or low altitude streams, rivers, lakes, etc.) and local needs, legal regulations.

Standard parameters

- temperature, pH-level, conductivity, dissolved oxygen, turbidity, chlorophyll-a, blue algae, COD,TOC, PO_4^{3-}, NH_4^+, NO_2^-, NO_3^-
- toxicology

Indicator parameters

Physical and chemical parameters

Modular System

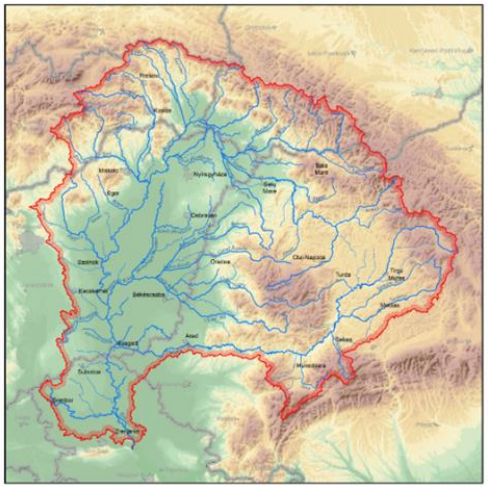
Extended parameters

Poliaromatic hydrocarbon (PAH), SO_4^{2-}, Na^+, Ca^{2+}, Mg^{2+}, K^+, Zn, Cd, Co, Fe, Pb, Cu, Ni, Mn, Cr, BTX, pesticides, pharmaceutics residues

Special parameter – radiation measurement

Part 2

Evaluation of **measurement methods** usable at monitoring stations and describing and **specifying monitoring systems** required for their implementation



WATER QUALITY EARLY WARNING SYSTEM

ON TRANSBOUNDARY WATERCOURSES of Tisza river basin

Chapter 1-2

Chapter 1-2

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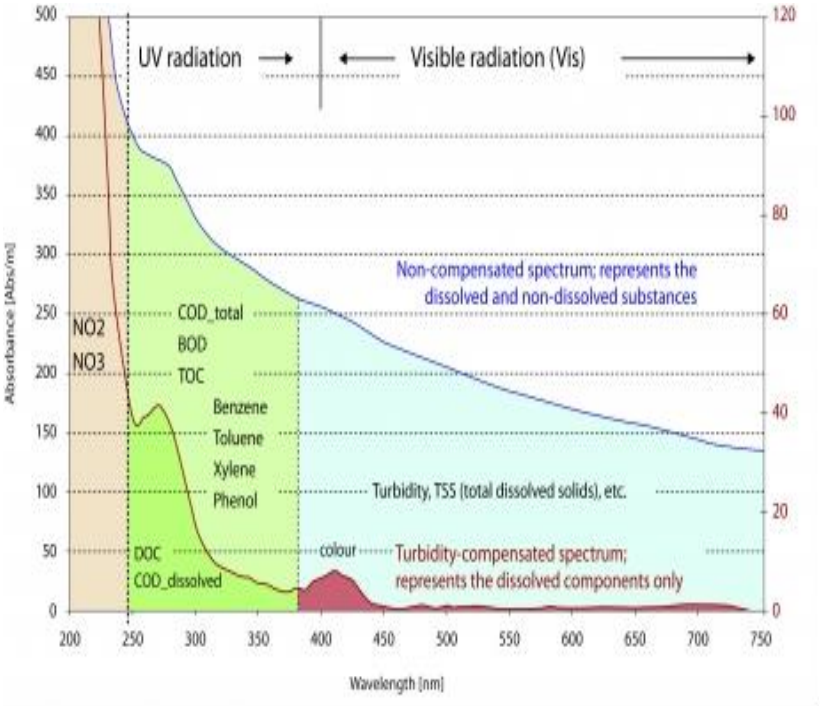
Methods

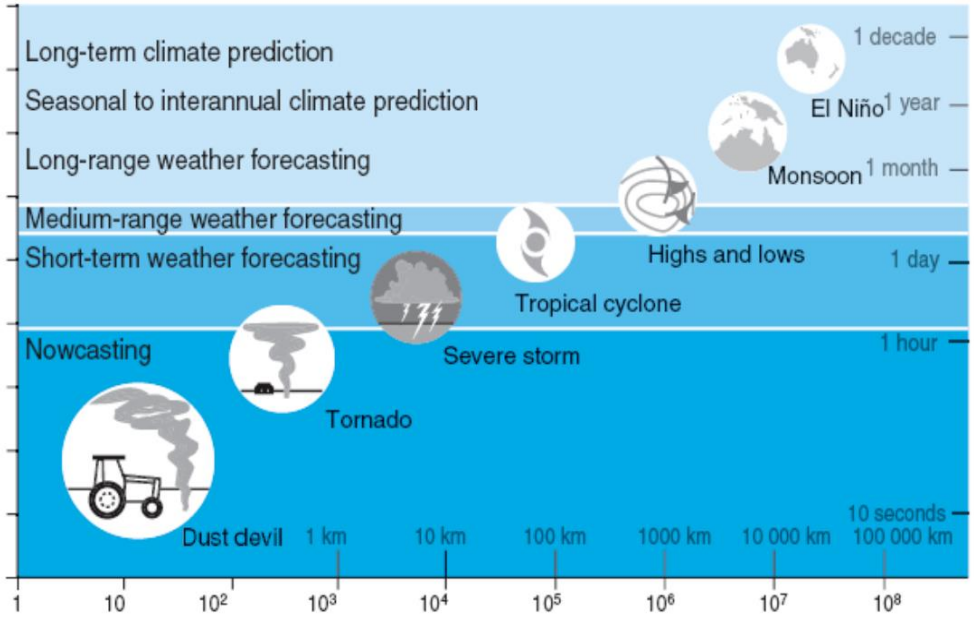
with different cost level



- UV-VIS spectroscopy
- Potenciometria
- Electrochemical
- Redox potential
- Fluorescent spectroscopy
- Water sampler
- Passive sampler

How early

is the early forecast?



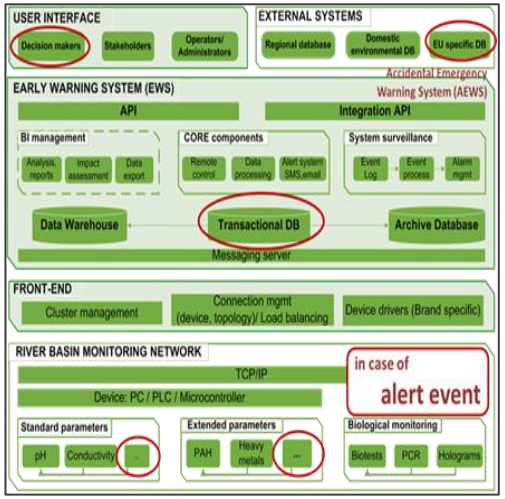
Time scale of forecasts

(Golnaraghi M., 2005)

- **Quick-onset**
  accidents in chemical plant, flood
- **Slow-onset dangers**
  nitrogen overload, reduction of biodiversity

Part 3

Evaluation of technically applicable **sampling systems** in the EWS , taking into account different **riverbed types**, furthermore sample and **data archivation system** types and introduction of design options



WATER QUALITY EARLY WARNING SYSTEM

ON TRANSBOUNDARY WATERCOURSES of Tisza river basin

Chapter 3-4, 2014

Chapter 3

Environmental *Institute, SK*

Basic principles

- Basic CookBook approach
- Lego principle
- Pre-installed host principle
- Rack case principle

CookBook

CookBook is an IT-based catalogue system that recommends a pre-modelled, detailed and applicable scenario for particular situations. It provides ready-made solutions for sub-basin areas where the page matching the particular typology, risk, task and budget can be found or can be filtered electronically.

Part 4

Calculation of **investment** and **operational costs** for the monitoring system to be developed

WATER QUALITY EARLY WARNING SYSTEM

ON TRANSBOUNDARY WATERCOURSES of Tisza river basin

Chapter 3-4, 2014

Chapter 4

Environmental *Institute, SK*

EWS principles

- **viewpoint** of prevention of catastrophes
- remote **controlled**
- **continuously** operating monitoring stations
- „**cookbook**" with various customization possibilities adaptable to given situations
- different warning **scenarios** can be worked out
- **standardization** of the
  - installation methods and
  - sampling techniques
- opened **framework** (EWS)

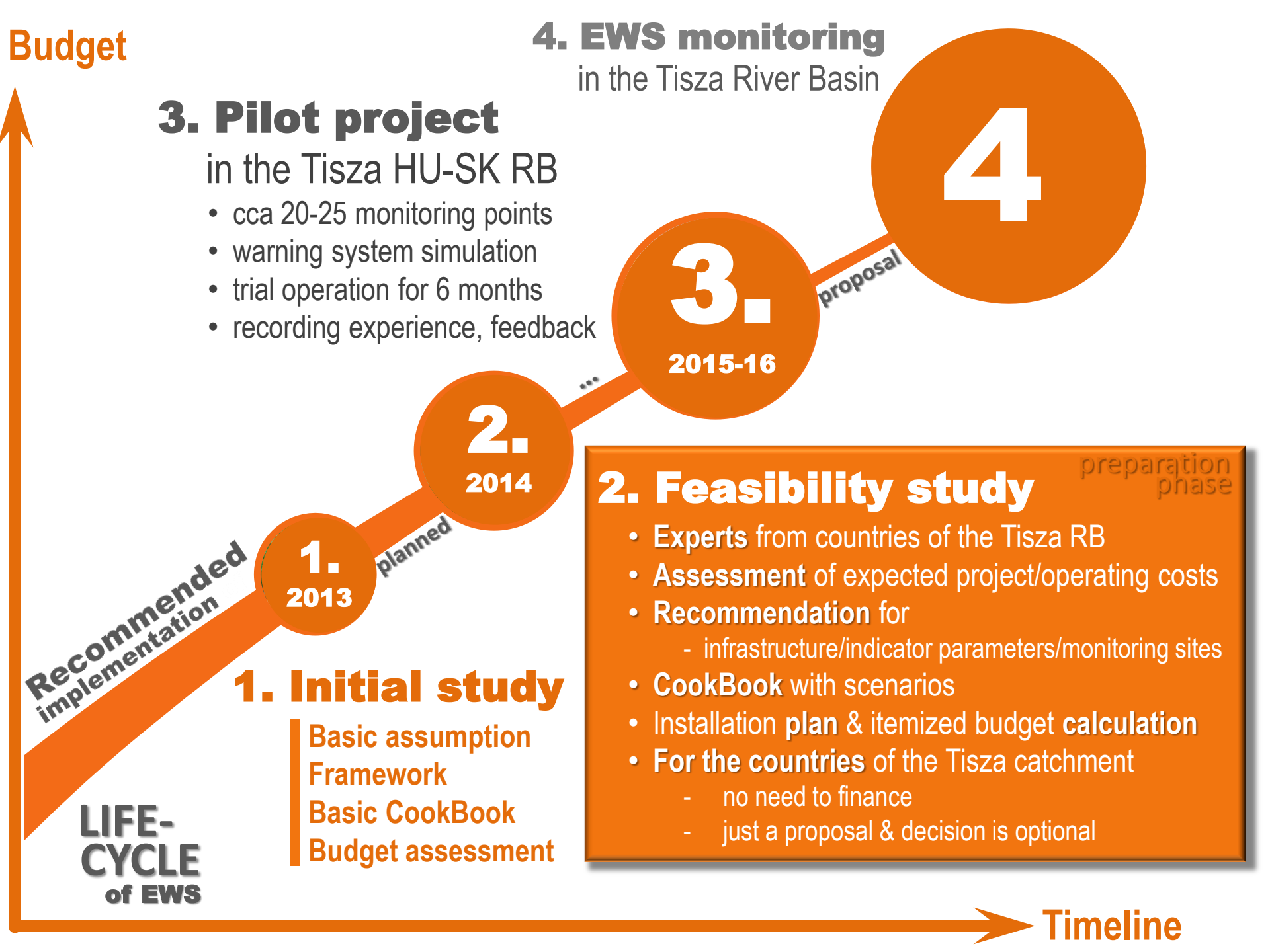
Indicator parameters

suitable
physicochemical and toxicological

shared information
modularity

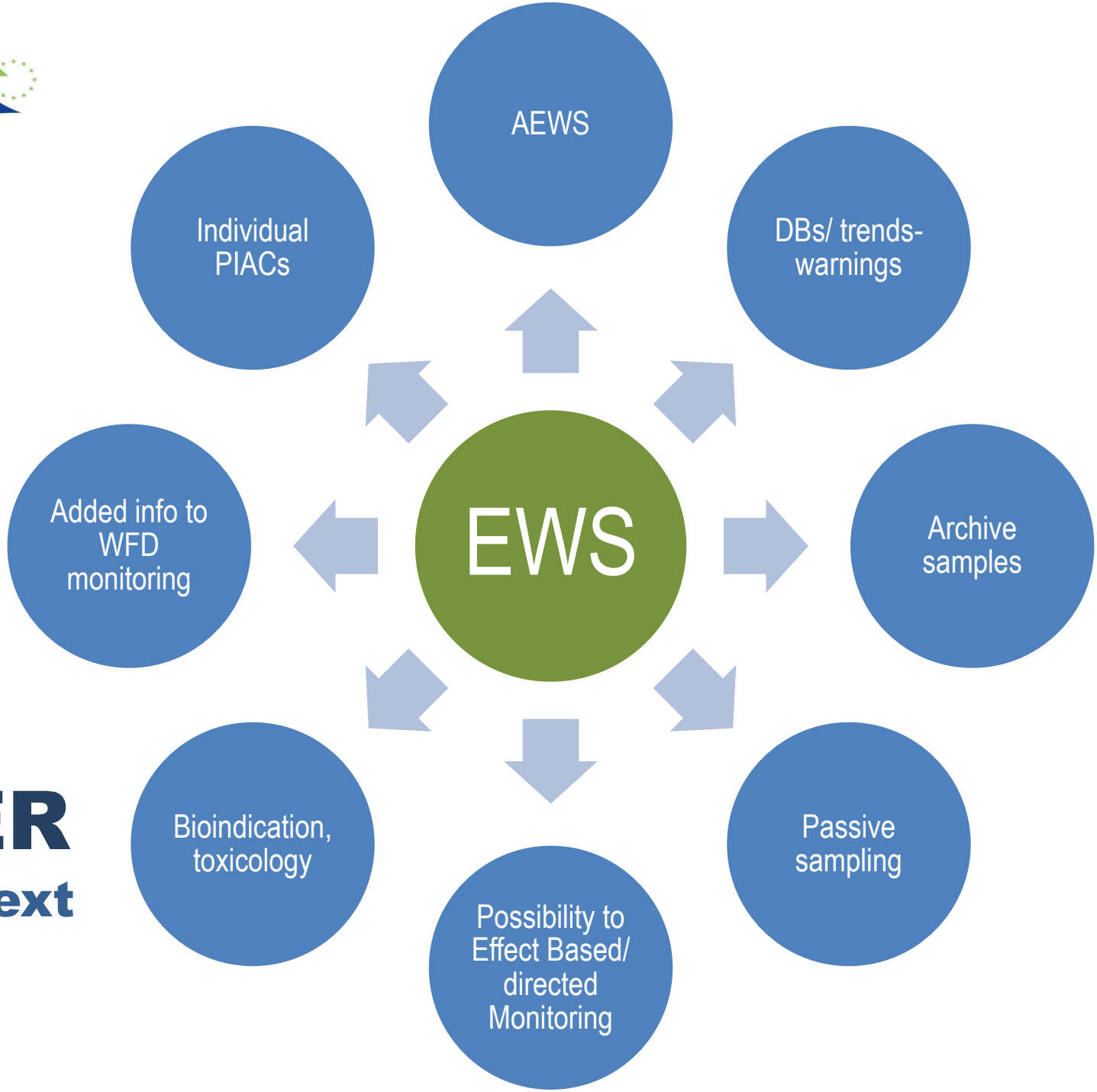
Expectations

- monitoring with
  - economical & minimal operating **costs**
- operational **reliability** and **availability** & robustness
- different capabilities of the involved **countries**
  - cross-border **cooperation**
  - pilot is focused on the Tisza catchment


Budget
4. EWS monitoring
in the Tisza River Basin
3. Pilot project
in the Tisza HU-SK RB
• cca 20-25 monitoring points
• warning system simulation
• trial operation for 6 months
• recording experience, feedback
4
3.
2015-16
proposal
...
2.
2014
planned
1.
2013
Recommended
implementation
2. Feasibility study
preparation phase
• Experts from countries of the Tisza RB
• Assessment of expected project/operating costs
• Recommendation for
- infrastructure/indicator parameters/monitoring sites
• CookBook with scenarios
• Installation plan & itemized budget calculation
• For the countries of the Tisza catchment
- no need to finance
- just a proposal & decision is optional
1. Initial study
Basic assumption
Framework
Basic CookBook
Budget assessment
LIFE-CYCLE of EWS
Timeline

DANUBE REGION strategy
Water Quality

WIDER
context



DANUBE REGION strategy
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Thank for your attention!

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